



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/712,827	11/14/2000	Loi Nguyen	93-C-077C1	4608

30425 7590 05/20/2003

STMICROELECTRONICS, INC.
MAIL STATION 2346
1310 ELECTRONICS DRIVE
CARROLLTON, TX 75006

EXAMINER

PHAM, LONG

ART UNIT PAPER NUMBER

2814

DATE MAILED: 05/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/712,827

Applicant(s)

NGUYEN ET AL.

Examiner

Long Pham

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 35-53 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1, 35, 37-43, and 45-53 is/are rejected.
- 7) ☒ Claim(s) 36 and 44 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 35, 37, 38, 39, 40, and 41 are rejected under 35 U.S.C. 102(b) as being anticipated by Bohr (US '034).

Bohr teaches a fabrication method, comprising the steps of:

forming a dielectric structure over a contact region 34, the dielectric structure, comprising (fig. 5 and associated text):

a first layer 33 formed from a first material (fig. 5 and associated text); and

a second layer 36 overlying the first layer and formed from a second material which may be selectively etched with respect to the first material (fig. 5 and associated text);

forming and patterning a resist layer 37 over the dielectric structure;

selectively etching the second layer through an opening through the patterned resist layer utilizing an etch which is selective of the first material over the second material (fig. 6 and associated text); and

without stripping the resist layer, etching the dielectric structure through the opening within the patterned resist layer and any etched region within the second layer to form a contact opening extending through the dielectric structure and exposing the contact region (fig. 7 and associated text).

With respect to claim 33, Bohr further teaches that a third layer 32 of a material different than the first material is formed underlying the first layer. See fig. 5 and associated text.

With respect to claim 37, Bohr further teaches that an opening is formed in the second layer when the second layer is selectively etched. See fig. 5 and associated text.

With respect to claim 38, Bohr further teaches that the second layer is selectively and isotropically etched to form an opening that undercuts the patterned resist layer. See fig. 5.

With respect to claim 39, Bohr further teaches that the second layer is selectively etched by a wet etch process. See fig. 5 and associated text.

With respect to claims 40 and 41, Bohr further teaches that a remainder of the opening that extends through the dielectric structure through the opening within the patterned resist layer is etched by a relatively anisotropic etch process or plasma etch process. See fig. 7 and associated text.

1. Claims 42, 43, 45, 46, 47, and 48 are rejected under 35 U.S.C. 102(b) as being anticipated by Bohr (US '034).

Bohr teaches an intermediate integrated circuit structure, comprising:

a substrate 30 including a contact region 34;

a dielectric structure over the substrate, the dielectric structure comprising:

a first layer 33 of a first material (fig. 5 and associated text); and

a second layer 36 overlying the first layer and of a second material

which may be selectively etched with respect to the first material (fig. 6 and associated text);

an opening through the dielectric structure and exposing the contact region, the opening including (fig. 6 and associated text):

a first portion extending through the second layer having a sloped or concave sidewalls (fig. 7 and associated text), and

a second portion extending through the first layer and having substantially vertical sidewalls (fig. 7 and associated text); and
a patterned resist layer overlying the dielectric structure, the patterned resist layer having an opening therethrough over the opening through the dielectric structure (fig. 5 and associated text).

With respect to claim 43, Bohr further teaches a third layer 32 underlying the first layer and of a material different than the first material. See fig. 5 and associated text

With respect to claim 45, Bohr further teaches that the first portion of the opening through the dielectric structure undercuts the patterned resist layer. With respect to claim 46, Bohr further teaches that the opening through the dielectric structure has a Y-shaped profile. See fig. 7 and associated text.

With respect to claim 46, Bohr further teaches that the opening through the dielectric structure is wider within the first portion than the opening through the patterned resist layer. See fig. 7 and associated.

With respect to claim 47, Bohr further teaches that the opening through the dielectric structure has a width within the second portion approximately equal to a width of the opening through the patterned resist layer. See fig. 7 and associated text.

3. Claims 49, 50, 52, and 53 are rejected under 35 U.S.C. 102(b) as being anticipated by Bohr (US '034).

Bohr teaches a method of forming a contact opening, comprising:
forming a dielectric structure over a contact region 34, the dielectric structure comprising:

a first layer 33 of a first material (fig. 5 and associated text); and
a second layer 36 overlying the first layer and of a second material
which may be selectively etched with respect to the first material (fig. 6 and
associated text);

forming and patterning a resist layer 37 over the dielectric structure (fig. 5
and associated text).

selectively etching the second layer through an opening through the
patterned resist layer utilizing a relatively isotropic etch process which is
selective of the first material over the second material and which undercuts
the patterned resist layer in an etched region formed by the relatively
isotropic etch process (fig. 6 and associated text); and

without stripping the resist layer, etching the dielectric structure, utilizing a
relatively anisotropic etch process, through the opening within the patterned
resist layer and the etched region within the second layer to form a contact
opening extending through the dielectric structure and exposing the contact
region (fig. 7 and associated text).

With respect to claim 50, Bohr further teaches that the opening is formed
through the second layer by etching while the first layer acts as an etch
stop. See fig. 7 and associated text.

With respect to claim 52, Bohr further teaches that a remainder of the
opening through the dielectric structure through the opening through the
patterned resist layer and through the opening through the second layer is
etched by plasma etch process. See fig. 7 and associated text.

With respect to claim 53, Bohr further teaches that the plasma etching
process with the patterned resist layer. See fig. 7 and associated text.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 51 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bohr (US '034) as applied to claims 49, 50, 52, and 53 above, and further in view of the following remarks.

Bohr teaches that the second layer is made of silicon dioxide but fails that the second layer is made of borophosphosilicate glass as recited in present claim 51.

However, the use of borophosphosilicate glass as interlevel dielectric is well-known to one skilled in the semiconductor art.

Allowable Subject Matter

6. Claims 36 and 44 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

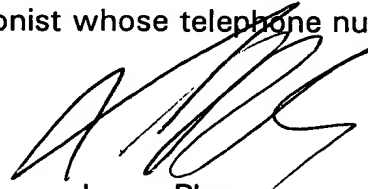
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Long Pham whose telephone number is 703-308-1092. The examiner can normally be reached on M-F, 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 703-308-4918. The fax phone numbers for the organization where this application or proceeding is

Art Unit: 2814

assigned are 703-746-4082 for regular communications and 703-746-4082 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

A handwritten signature in black ink, appearing to read 'Long Pham', is written over the printed name.

Long Pham

Primary Examiner

Art Unit 2814

L. P.

May 18, 2003